ABSTRACT:

The realization of Bose-Einstein condensates (BECs) has revolutionized atomic physics. BECs allow the observation of striking quantum effects, such as matter-wave interference, on macroscopic scales. This BEC interference can also be leveraged to make extremely accurate measurements of fundamental constants. In this talk, I will outline the various mathematical descriptions of a BEC. I will focus on techniques, such as analytic reductions of the nonlinear Schrodinger equation, for extremely accurate models that are useful to high-precision interference measurements. Finally, I will discuss current experiments with other ultra-cold atom systems in the Ketterle group.